REMARKS

AMENDED CLAIM 5

Independent claim 5 has been amended to limit the method for making a wear-resistant electrically conductive body, to simultaneously ion-accelerating ions from separate copper ion and carbon ion sources onto a negatively charged electrically conductive body.

Deutchman et al. teach one to clean a surface of an uncharged substrate 16, in a section 12, by using an ion beam 18 of an inert gas. The inert gas is gaseous, and is not permanently deposited on the substrate. The inert gas remains a gas within chamber 10. Deutchman et al.do not permanently deposit a coating on substrate 16 from the ionized inert gas.

Deutchman et al. then sputter a thin layer of sputtered uncharged atoms on the cleaned surface of the uncharged substrate, from a sputter section 14. The sputter section 14 heats up the sputtered atoms with an ion beam 28. The sputtered atoms are not controllably applied to substrate 16 by a voltage difference used in applicants' ion-acceleration.

Applicants teach controlled. simultaneous, deposition of both copper ions and diamond-like carbon ions onto a negatively charged electrically conductive body by using ion-acceleration.

Deutchman et al. do not teach or suggest forming a coating on a negative charged electrically conductive body, the coating made up of copper and diamond-like carbon. Deutchman et al. do not simultaneously ion-accelerate positively charged copper ions and positively charged carbon ions, from two separate ion sources, onto the negatively charged electrically conductive body and thereby permanently deposit a copper plus

diamond-like carbon coating on the body. Deutchman et al. do not teach or suggest a permanently deposited copper and diamond-like carbon coating on a body , the copper and diamond-like carbon coming from a copper ion source and a separate diamond-like carbon ion source.

Kimock et al. first form an inter-layer onto an uncharged substrate preferably by ion beam sputtering or magnetron sputtering. They mention many other means, including thermal evaporation, electron beam evaporation, thermally-activated deposition, glow discharge, plasma or ion beam deposition from gaseous precursor materials. They do not select the other means nor teach one how to use the other means. By not selecting those other means, and teaching their use, Kimock et al. teach away from the other means. Further, ion beam deposition cannot be effectively used since the substrate of Kimock et al. is uncharged.

Kimock et al. then form a diamond-like carbon layer on the first inter-layer, and lower uncharged substrate, by chemical vapor deposition.

Kimock et al. do not teach or suggest simultaneous ion-acceleration of positively charged copper ions and positively charged carbon ions onto a negatively charged electrically conductive body, an electrically conductive plus diamond-like carbon coating being permanently deposited on the negatively charged electrically conductive body.

Kimock et al. do not suggest to one with a knowledge of Deutchman et al., or visa versa, to use two separate copper ion and carbon ion sources to simultaneously ion-accelerate positively charged copper ions and positively charged carbon ions onto a negatively charged electrically conductive body. Kimock et al do not suggest to one with a knowledge of Deutchman et al.. or visa versa, to permanently deposit a copper and

diamond-like carbon coating, from a copper ion source and a separate diamond-like carbon ion source, onto a negatively charged electrically conductive body.

AMENDED CLAIM 7

Independent claim 7 has been amended to claim steps including striking a diamond-like carbon source with a first ion beam to form ionized carbon atoms, ion-accelerating the ionized carbon ions onto a negatively charged electrically conductive surface, and simultaneously striking the ionized carbon atoms that are on the negatively charged electrically conductive surface with a second ion. beam. The second ion beam maintains the struck ionized carbon atoms in a metastable state, that is, ionized.

Deutchman et al places graphite atoms 32 on substrate 16 by directing an ion-beam 28 onto a graphite target 31. The graphite atoms 32 go onto uncharged substrate 16 due to the energy in their own momentum. The graphite atoms 32 fly in many directions during the deposition process.

Deutchman et al.does not suggest to ionize carbon atoms by means of a first ion beam. The graphite of Deutchman et al. is not taught as being formed into ionized carbon atoms. Deutchman et al. does not suggest to ion-accelerate ionized carbon atoms onto a negatively charged electrically conductive surface, as shown in Figure 2 of applicants.

Further Deutchman et al. does not suggest using a second ion beam to strike the carbon atoms, in order to maintain the ionized carbon atoms in a metastable state. The applicants teach that the carbon atoms that go on the negatively charged electrically conductive surface are in a metastable state, that is, ionized.

Deutchman et al. does not suggest amended claim 7.

It is respectfully submitted that the present patent application is now in condition for allowance and early allowance is respectfully requested.

Respectfully Submitted,

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1. (previously presented) A wear-resistant electrically conductive body, comprising:

(a) an electrically conductive body; and

(b) an ion-accelerated, wear-resistant, electrically conductive coating on the electrically conductive body, the ion-accelerated, wear-resistant, electrically conductive coating containing contiguous metal atoms and diamond-like carbon atoms.

2. (previously presented) A plurality of wear-resistant electrically conductive circular slip-rings on a rotor, comprising:

(a) a plurality of electrically conductive circular slip-rings on a rotor, each electrically conductive circular slip-ring having a circular outer surface; and

(b) a circular ion-accelerated, wear-resistant, electrically conductive coating on the circular outer surface of each electrically conductive circular slip-ring, each circular ion-accelerated, wear-resistant, electrically conductive coating containing simultaneously ion deposited, contiguous, metal-ion-accelerated metal atoms and carbon-ion-accelerated diamond-like carbon atoms.

3. (previously presented) Each wear-resistant electrically conductive circular slip-ring of claim 2 wherein the simultaneously ion deposited, contiguous, metal-ion-accelerated metal atoms are contiguous copper-ion-accelerated copper atoms.

4. (previously presented) Wear resistant electrically conductive circular slip-rings of claim 2, each wear resistant electrically conductive circular slip-ring further comprising an interfacial layer between the circular ion-accelerated, wear resistant, electrically conductive coating and the electrically conductive circular slip-ring.

5. (currently amended) A method for making a wear-resistant electrically conductive body having an electrically conductive diamond-like carbon coating, comprising ion-accelerating positively charged copper ions from a copper ion source onto a negatively charged electrically conductive body, and simultaneously ion-accelerating positively charged diamond-like carbon ions from a separate carbon ion source onto ~~an~~ the negatively charged electrically conductive body, the ion-accelerating of the positively charged copper ions and positively charged diamond-like carbon ions occurring simultaneously, an electrically conductive copper plus diamond-like carbon coating being permanently deposited on the negatively charged electrically conductive body, from the positively charged ion-accelerated copper ions and the positively charged ion-accelerated diamond-like carbon ions.

6. (previously presented) A wear-resistant electrically conductive body, comprising:

(a) an electrically conductive body; and

(b) an electrically conductive ion-formed diamond-like surface on the electrically conductive body, the surface containing diamond-like, amorphous carbon and graphite, the amorphous carbon and graphite being in a contiguous configuration.

7. (currently amended) A dual ion-beam process for depositing a wear-resistant diamond-like carbon coating on ~~an~~ a negatively charged electrically conductive surface, comprising

(a) ~~sputtering~~ striking a surface of a diamond-like carbon source with a first ion beam to form ionized carbon atoms;

(b) ion-accelerating the ionized carbon atoms onto the negatively charged electrically conductive surface;

~~(b)~~ (c) simultaneously striking the ionized carbon atoms that are on the negatively charged electrically conductive surface with a second ion beam, in order to maintain the struck ionized carbon atoms in a metastable state;

~~(c)~~ (d) adjusting power and intensity of the first ion beam in order to control an intensity of energy applied to the diamond-like carbon source; and

~~(d)~~ (e) adjusting power and intensity of the second ion beam, in order to control characteristics of a wear-resistant diamond-like coating on the negatively charged electrically conductive surface.